

WHAT IS CLAIMED IS:

1 1. A method for filtering a gas-flow, the method comprising:
2 (a) receiving the gas-flow through at least one of a duct and a housing containing a
3 filter;
4 (b) placing the filter in motion; and
5 (c) impacting particulate matter suspended within the gas-flow with the filter, as a
6 result of placing the filter in motion;
7 wherein upon impact the particulate matter is removed from the gas-flow.

1 2. The method of claim 1, wherein upon impact the particulate matter adheres to the
2 filter and is thereby removed from the gas-flow.

1 3. The method of claim 1, wherein upon impact the particulate matter is physically
2 trapped within the filter and is thereby removed from the gas-flow.

1 4. The method of claim 1, wherein upon impact the particulate matter is deflected from a
2 direction of motion of the gas-flow and is thereby removed from the gas-flow.

1 5. The method of claim 1, wherein (b) further includes:
2 (b.1) placing the filter in one of a rotational motion and an oscillating motion.

1 6. The method of claim 1, wherein (b) further includes:
2 (b.1) placing the filter in motion in a direction substantially perpendicular to a
3 direction of motion of the gas-flow.

1 7. The method of claim 1, wherein (b) further includes:
2 (b.1) placing the filter in motion at a rate of speed that is at least one of equal to and
3 greater than a speed of the filtered air-flow scaled by a ratio of a filter pore average width to a
4 filter pore average depth.

1 8. The method of claim 1, wherein (b) further includes:

2 (b.1) placing the filter in motion at a speed that is two to one-thousand times greater
3 than a speed of the filtered air-flow scaled by a ratio of a filter pore average width to a filter
4 pore average depth.

1 9. The method of claim 1, further comprising:

2 (d) receiving feedback related to at least one of an operational performance and an
3 operational condition of the filter.

1 10. The method of claim 9, wherein the received feedback includes at least one of:

2 a measure of a pressure of the gas-flow before passing through the filter;

3 a measure of a pressure of the gas-flow after passing through the filter;

4 a measure of a pressure differential across the filter;

5 a measure of a particle buildup within the filter;

6 a measure of a speed of the filter;

7 a measure of a speed of the gas-flow;

8 a measure of at least one of a number of particles and a size of particles in the air-flow
9 before passing through the filter; and

10 a measure of at least one of a number of particles and a size of particles in the air-flow
11 after passing through the filter.

1 11. The method of claim 9, further comprising:

2 (e) adjusting a speed of the filter in response to the received feedback.

1 12. The method of claim 11, wherein (e) further includes:

2 (e.1) assessing the received feedback to determine whether to at least one of increase
3 the filter speed and decrease the filter speed in response to the received feedback.

1 13. The method of claim 11, wherein (e) further includes:

2 (e.1) adjusting the speed of the filter to sustain a user specified performance criteria.

1 14. The method of claim 13, wherein the user specified performance criteria is at
2 least one of:

3 a user specified pressure drop across the filter; and

4 a user specified efficiency in trapping particles of a user specified minimum size.

1 15. An apparatus for filtering a gas-flow, the apparatus comprising:
2 a housing to receive a gas-flow and to convey the gas-flow in a direction of motion
3 through the housing;
4 a filter positioned within the housing;
5 a filter-motion-control module to place the filter in motion, said filter-motion-control
6 module further comprising:
7 a motor to create mechanical energy in accordance with operator input received from
8 the user interface; and
9 a drive-assembly module, connected between the motor and the filter to convey
10 mechanical energy from the motor to the filter;
11 wherein the filter impacts particulate matter suspended within the gas-flow as a result
12 of the filter motion and thereby removes the particulate matter from the gas-flow.

1 16. The apparatus of claim 15, wherein upon impact the particulate matter adheres to
2 the filter and is thereby removed from the gas-flow.

1 17. The apparatus of claim 15, wherein upon impact the particulate matter is
2 physically trapped within the filter and is thereby removed from the gas-flow.

1 18. The apparatus of claim 15, wherein upon impact the particulate matter is deflected
2 from a direction of motion of the gas-flow and is thereby removed from the gas-flow.

1 19. The apparatus of claim 15, wherein the filter-motion-control module further

2 comprises:

3 a user-interface module to receive input from an operator.

1 20. The apparatus of claim 15, wherein the filter-motion-control module further

2 comprises:

3 a speed-control module to control the speed of the filter motion.

1 21. The apparatus of claim 20, wherein the speed-control module is configured to
2 place the filter in motion at a rate of speed that is at least one of equal to and greater than a
3 speed of the filtered air-flow scaled by a ratio of a filter pore average width to a filter pore
4 average depth.

1 22. The apparatus of claim 20, wherein the speed-control module is configured to
2 place the filter in motion at a speed that is two to one-thousand times greater than a speed of
3 the filtered air-flow scaled by a ratio of a filter pore average width to a filter pore average
4 depth.

1 23. The apparatus of claim 15, wherein the filter-motion-control module is
2 configured to place the filter in one of a rotational motion and an oscillating motion.

1 24. The apparatus of claim 15, wherein the filter-motion-control module is
2 configured to place the filter in a direction of motion substantially perpendicular to the
3 direction of motion of the gas-flow through the housing.

1 25. The apparatus of claim 19, wherein the filter-motion-control module further
2 comprises:
3 a motor-control unit to receive input from an operator via the user-interface module
4 and to control the motor in accordance with said received input.

1 26. The apparatus of claim 25, wherein the filter-motion-control module further

comprises:

a feedback sensor to send information related to at least one of a filter operational condition and a filter level of performance to the motor-control unit.

27. The apparatus of claim 26, wherein the motor-control unit further includes a feedback reception module to receive feedback sensor information related to at least one of:

a pressure of the gas-flow before passing through the filter;

a pressure of the gas-flow after passing through the filter;

a pressure differential across the filter;

a particle buildup within the filter;

a speed of the filter;

a speed of the gas-flow;

at least one of a number of particles and a size of particles in the air-flow before

passing through the filter; and

at least one of a number of particles and a size of particles in the airflow after passing through the filter.

28. The apparatus of claim 26, wherein the motor-control unit further comprises:

a motor-speed-adjustment module to adjust the speed of the filter in response to the received feedback.

29. The apparatus of claim 15, wherein the motor-speed-adjustment module further comprises:

a performance module to determine whether to at least one of increase the motor speed and decrease the motor speed in order to sustain a performance criteria received via the user interface module.

30. The apparatus of claim 19, wherein the performance criteria is at least one of:

a user specified pressure drop across the filter; and

a user specified efficiency in trapping particles of a user specified minimum size.

1 31. A filter for filtering a gas-flow, comprising:

2 a filter material having a plurality of open spaces defined within, wherein an average
3 cross-sectional area of the plurality of defined open spaces is greater than an average cross-
4 sectional area of a smallest particle the filter is configured to remove from the gas-flow; and
5 a means for receiving mechanical energy to place the filter material in motion.

1 32. The filter of claim 31, wherein the filter material is configured as a hollow cylinder
2 configured to rotate about a longitudinal center axis of the hollow cylinder.

1 33. The filter of claim 31, wherein the filter material is configured into a sheet with a
2 substantially planar surface and configured to rotate about a center axis perpendicular to the
3 planar surface of the filter material.

1 34. The filter of claim 31, wherein the filter material is planar and configured to oscillate
2 within a plane.

1 35. The filter of claim 31, wherein the filter material includes at least one of a grid, a
2 mesh and a plurality of bars.

1 36. The filter of claim 31, wherein the means for receiving mechanical energy is a hub
2 centered upon a center axis of the filter material.

1 37. The filter of claim 31, wherein the means for receiving mechanical energy is located
2 upon a perimeter of the filter material.

1 38. The filter of claim 31, wherein the means for receiving mechanical energy is
2 configured to receive mechanical energy from a drive module to place the filter material in one
3 of a rotational motion and an oscillating motion.

1 39. The filter of claim 31, wherein the means for receiving mechanical energy is
2 configured to receive mechanical energy from a drive module to place the filter material in one
3 of a rotational motion and an oscillating motion that is substantially perpendicular to a direction
4 of motion of the filtered air-flow.

1 40. The filter of claim 31, wherein the means for receiving mechanical energy is
2 configured to place the filter in motion in a direction substantially perpendicular to a direction of
3 motion of the filtered gas-flow.